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PRACTICAL SUGGESTIONS FOR IMPROVING VITAL
STATISTICS.BY FREDERICK L. HOFFMAN.

The accurate registration and qualified analysis of vital statistics is one of the most important functions of government. Vital statistics alone furnish a definite measure of the value of sanitary improvements and the progress of medicine and surgery. Vital statistics furnish the basis of an approximate estimate of national health, and they indicate with reasonable certainty tendencies making for national advance or deterioration. While considerable progress has been made in perfecting methods of registration and analysis, much remains to be done to secure uniformity in plans and purposes to increase the practical usefulness of the data collected. Much valuable material is collected which is not properly brought to public attention, and it is rather the exception than the rule that the official reports of health officers or registrars of vital statistics contain the extended and critical analysis of the vital facts of the community indispensably required for an intelligent understanding of the health history of the community. Most of the reports are limited to a crude presentation of the mortality data, and estimates of population are often arrived at by a method which falls little short of guess-work. As the result of a rather extended knowledge of methods of registration and the official publications of health departments throughout the United States and other countries, I have brought together a few suggestions for the practical improvement of our vital statistics, which, in one direction or another, may be applicable to the solution of local problems. Of necessity my remarks are limited to a brief statement of existing needs, with suggestions derived from actual experience. I am confident that most of the suggestions are entirely feasible, and that their adoption will materially improve the value of health reports for the purposes which they are intended to serve.

Annual Report and Sanitary Survey.

The annual report of the health officer should contain a brief sanitary survey of the locality reported upon, with observations upon the altitude, climate, surface geology, soil, subsoil, water supply, natural drainage, sewage and garbage disposal, and prevailing types of insects injurious to health. If possible, the report should be accompanied by a map

conforming to the standard of the topographic atlas sheets of the United States Geological Survey. Every ten years at least a special report should be prepared, conforming, on the whole, to the method adopted by the medical inspector of the Local Government Board for Ireland, in his Report on the Sanitary Circumstances and Administration of the City of Dublin, with special reference to the causes of the high death-rate.*

Preliminary Statement of Annual Mortality.

An abstract of the mortality from all causes and principal causes, including the mortality at certain ages, should be prepared as soon as possible after the close of the year, in conformity to the method adopted by the Department of Health of the City of New York. This report gives information for thirty-five specified causes of death, the mortality for four divisions of life, the general mortality by sex and color, with a separate statement of the mortality of Chinese, the deaths in institutions, tenements, dwellings, hotels, and a preliminary calculation of the crude death-rate.

Decennial Abstract of Mortality.

The mortality of the preceding decade should be presented in a convenient tabular form exclusive of the year reported upon, showing respectively the mortality from all causes and deaths by sex, color, and general nativity, also the deaths at ages under one and from one to five, together with the population accurately estimated for intercensal years.

* Report on the Sanitary Circumstances and Administration of the City of Dublin, with Special Reference to the Causes of the High Death-rate, by Surg.-Col. D. Edgar Flinn, F.R.C.S., D.P.H., Medical Inspector of the Local Government Board for Ireland, 1906.

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The method used in estimating the population should be stated in full, but, if possible, preference should be given to the arithmetical method for cities with a rapidly growing population. The mortality rates should be per thousand of population for the mortality from all causes and per ten thousand of population for specified causes. Deaths under one, and at ages one to five, should, in the absence of definite information regarding the corresponding population, be calculated in the form of a percentage of the deaths at all ages. This table should conform as far as possible to the method adopted by the Board of Health of the City of Boston, but in a somewhat more extended form.

Review of Mortality from Important Causes.

In the same manner the mortality from important causes of death should be reviewed for the preceding decade, exclusive of the year under consideration, including a statement of the actual deaths from each cause and the corresponding death-rates per ten thousand of estimated population for intercensal years. This method is admirably illustrated in the report of the Board of Health of Chicago, 1904-05. Among the more important causes to be considered should be small-pox, typhoid fever, malaria, phthisis, other tubercular diseases, all of the acute infectious diseases of children, pneumonia, other respiratory diseases, suicides, accidents, homicides, and deaths in pregnancy.

Early Vital Records.

Cities and towns with records extending over a long period of years should extend the decennial review for certain important diseases over the entire period of registration in the manner as this has been done in Table 13 of the Report of the Board of Health of Boston for 1906, and in the second volume of the Annual Report of the Department of Health for the City of New York (pp. 774-870). In this connection it may also be suggested that it would be of value if each registrar would state the history and extent of registration and give a catalogue of the books of record, such as will be found on pages 341 *et seq.* of the Annual Report of the Registry Department of the City of Boston for the year 1905.*

* Every board of health, municipal or State, publishing an annual report, should send a copy of the same to the Library of the Surgeon-General, U.S.A., Washington, D.C. This library has the largest collection of works on medical and sanitary science in the world, and the accessions are from time to time indexed in a subject index catalogue, of which a second series is now nearing completion. The library extends the loan of books and documents to qualified persons throughout the United States, under liberal rules and regulations, by which method the same become accessible to all. The library admirably serves the purpose of a central depository for reports of this character in the absence of properly supported medical libraries throughout the country, specializing in the direction of public health and sanitary science.

Mortality Record by Single Years of Life.

One of the most important additions to our present knowledge of human mortality would be a table of deaths by single years of life. No report of a board of health at present gives this specific information, which, for a variety of purposes, is of the greatest possible practical value. An attempt in this direction, however, is to be found in the annual reports of the Board of Health of Brookline, Mass., which require to be only slightly amplified to conform to the requirement stated. The Brookline report gives the mortality in the form of a running account of every death occurring, stating: first, the date; second, the cause; third, the sex; fourth, the conjugal condition; fifth, the exact age in years, months, and days; and, seventh, the occupation. In addition, however, the race and nativity should be stated. It may be difficult for large cities to present these facts in just the same manner, since in Brookline, during 1906, only 351 deaths were thus registered, but by means of this return any combination of facts can be worked out for a variety of purposes. Cities adopting the Brookline method should, however, in addition, tabulate the deaths, showing the number occurring at each age (and not by groups, as is the usual custom), with distinction of sex, color, and general nativity. Such a table would not require much labor, and would take up no more than a single page of the report. This method should also be adopted in the mortality reports of the census for the registration area of the United States.

Details of Infant Mortality.

The mortality of children should, if possible, be given by single months for the first two years of life and for the more important causes of death. As a rule, the mortality during the first year only is given by single months, but it would serve a very practical purpose to trace the course of mortality with greater accuracy by months during the second year of child life. This method has been adopted in the annual reports of the city of Berlin, and for the first year of life in the reports of the registrar-general of England and Wales. Wherever the information can be obtained, the distinction should be made between children breast-fed and bottle-fed, to trace with more accuracy the possibly injurious effects of artificial feeding. An excellent illustration of the method which should be adopted is to be found on page 50 of the Annual Report of the Medical Officer of Health of Blackburn, England, giving the particulars of the nursing and feeding of 2,705 children under seven months old visited by the inspectors of the department. The inspections were made by lady inspectors or health visitors, who also gave much valuable instruction to future mothers as a means of reducing infant mortality. It is hardly

necessary to add that the still-born should never be included in the statement of either births or deaths, but separately in a special table, with distinction of sex.*

Mortality of School Children.

The health and mortality of children of school age, say six to fourteen, should receive special consideration. A request might be made of school superintendents to report from week to week the deaths among pupils, so that at the end of the year a table could be prepared showing the average number of pupils in different schools according to different grades, together with the mortality occurring among the children, supplemented by a statement of the ages at death and the principal causes. There are few questions of more serious public interest at the present time than the problem of school hygiene and the possible effect of erroneous methods of instruction upon the health and mortality of the children. For illustration of the method which might be adopted, but which

* INFANT AND CHILD MORTALITY OF BERLIN, GERMANY,† 1905.

Ages under 1 Year.				Ages 1 to 5 Years.			
Ages.	Males.	Females.	Total.	Ages.	Males.	Females.	Total.
Still-born	988	854	1,842	13th month . .	148	138	286
Found dead . .	15	11	26	14th " . .	129	112	241
1 day	398	277	675	15th " . .	112	122	234
2 days	187	121	308	16th " . .	83	78	161
3 "	116	85	201	17th " . .	79	79	158
4 "	53	43	96	18th " . .	58	60	118
5 "	48	30	78	19th " . .	54	64	118
6 "	40	35	75	20th " . .	48	55	103
7 "	41	29	70	21st " . .	52	61	113
1st week	898	631	1,529	22d " . .	46	41	87
2d week	302	210	512	23d " . .	51	36	87
3d and 4th weeks,	488	394	882	24th " . .	27	39	66
1st month . . .	1,688	1,235	2,923	1st year . . .	5,730	4,440	10,170
2d "	685	526	1,211	2d "	887	885	1,772
3d "	664	449	1,113	3d "	320	285	605
4th "	512	389	901	4th "	213	210	423
5th "	431	331	762	5th "	132	137	269
6th "	349	286	635				
7th "	297	283	580				
8th "	254	238	492				
9th "	249	208	457				
10th "	221	170	391				
11th "	207	176	383				
12th "	173	149	322				

† Statistical Year Book, City of Berlin, 26th issue, 1907, p. 65.

should be simplified to show the ages at death, see "Health at School," by Clement Dukes, published in London in 1905 (page 547).

Mortality Record of Institutions.

For cities and towns which have large institutions, such as hospitals, asylums for the insane, prisons, almshouses, military academies, universities, etc., special tables should be given, showing the mortality among the inmates of such institutions, according to age at death and the principal causes, together with a statement of the average number of inmates of the institutions reported upon. Such tables would prove of very considerable value in connection with special mortality investigations, and at the same time correct erroneous conclusions regarding the health and mortality of particular localities. Illustrations of the method to be adopted are to be found in the annual reports of the various soldiers' homes and the numerous reports of asylums for the insane, and prisons, showing the death-rate among the persons under observation. These tables, however, as a rule, do not conform to the general method of showing the mortality at different ages and for specified causes conforming in principle to the international classification of causes of death.*

* For a very valuable table of mortality, by single years of life, useful for institutions such as prisons, asylums, almshouses, etc., the report of the managers of the National Home for Disabled Volunteer Soldiers should be consulted. The report of the board for 1906 was prepared by W. E. Elwell, surgeon-in-chief, and from a table on page 136 I extract the mortality by single years of life for ages 60 and upwards as follows:—

MORTALITY OF INMATES OF SOLDIERS' HOMES, YEAR ENDING JUNE 30, 1906.

Ages	Number Cared for.	Number of Deaths.	Number of Deaths per 1,000.	Ages.	Number Cared for.	Number of Deaths.	Number of Deaths per 1,000.
60	1,598	62	38.80	81 . . .	299	39	130.43
61	1,936	97	50.10	82 . . .	257	38	147.86
62	2,249	95	42.24	83 . . .	165	24	145.45
63	2,368	100	42.23	84 . . .	170	22	129.41
64	2,200	105	47.73	85 . . .	158	15	94.94
65	2,199	120	54.57	86 . . .	127	15	118.11
66	2,329	108	42.08	87 . . .	71	15	211.27
67	1,844	95	51.52	88 . . .	55	7	127.27
68	1,769	115	65.01	89 . . .	35	1	28.57
69	1,627	86	52.86	90 . . .	14	3	214.29
70	1,303	104	79.82	91 . . .	13	3	230.77
71	1,167	102	87.40	92 . . .	21	2	95.24
72	1,197	88	73.52	93 . . .	9	1	111.11
73	983	87	88.50	94 . . .	13	2	153.85
74	844	64	75.83	95 . . .	6	2	333.33
75	744	71	93.03	96 . . .	6	—	
76	787	81	102.92	97 . . .	2	—	
77	574	65	113.41	98 . . .	5	1	200.00
78	479	45	93.95	99 . . .	2	2	1,000.00
79	412	53	128.64	100 . . .	1	1	1,000.00
80	349	54	154.72	104 . . .	1		

Fatality Rate of Institution Mortality.

For hospitals and similar institutions a special table should be given, showing the rate of fatality accurately calculated in conformity to the principles adopted by the London Metropolitan Asylums Board. The method, however, should be amplified to show the mortality from surgical operations. Valuable suggestions for the method to be adopted will be found in the annual reports of the Johns Hopkins Hospital of Baltimore. Most of the reports of hospitals and institutions are decidedly defective and more or less misleading, and uniformity of treatment, as well as improved statistical methods, are imperatively required. Since it is much more difficult to induce the different institutions to make necessary changes, it would be advisable for health officers to insist upon an accurate and specific return, to be incorporated in the annual municipal or state report.

Redistribution of Deaths in Institutions by Sanitary Districts.

Deaths in institutions should be redistributed according to the place or district of residence of the deceased, primarily, of course, to secure a more accurate return of the mortality by wards or minor sanitary divisions. No local sanitary survey can be of much value unless the actual mortality of each district is properly known, and serious errors result where the deaths in institutions are not redistributed according to the place of residence of the deceased. The effect of this error is particularly serious where hospitals for the treatment of special diseases, such as cancer and tuberculosis, attract a large number of patients from other sections of the city or the near-by country. This is probably one of the most serious underlying errors in most of the mortality reports of American cities, and, as I recall it, not even the city of New York makes a proper redistribution of deaths in institutions to correct the ward death-rates as published in its annual reports. If it is possible to make these corrections for as large a city as London, it would seem readily possible to do so for our large American cities. Claims are sometimes made, as in the case of New Orleans, that the entire mortality occurring in a large hospital should be deducted in the calculation of the local death-rate. There could be no more serious error in vital statistics than this, for it will be found upon careful inquiry that the actual mortality of non-residents in local hospitals is never as large as is hastily assumed. The value of this method and its application to local conditions is emphasized in the reports of Dr. Billings on the vital statistics of New York and Brooklyn, Philadelphia and Boston, Washington and Baltimore, published in connection with the census of 1890. An equally valuable and perhaps still more instructive illustration is

to be found in a map appended to the Annual Report of the Medical Officer of Health of Blackburn, England, for the year 1906, showing the death-rates in the enumeration districts of the borough of Blackburn. The existence of insanitary areas is readily traced by means of such maps, and the returns are, of course, of the greatest practical value when conceded to be accurate.

Mortality from Special Causes by Streets.

In connection with local inquiries into the causes of a high death-rate, it may be advisable to compile the mortality by streets, in much the same manner as this has been done for a number of years for Liverpool. For illustration, to emphasize the prevalence of diarrhœa during the year 1905, a table was prepared showing the mortality by streets on which three or more deaths from this disease occurred. It would not be difficult to obtain an approximate estimate of the populations of the different streets and to localize the mortality from any specific cause by this method.

Description of Sanitary Districts.

As a further aid in deliberate efforts to localize the causes of a high death-rate, the method adopted by the Registry Department of the City of Boston will be found of value, which includes a full account of the elements of population and the mortality of every ward in the city, including a brief but very comprehensive account of the topography and sanitary condition. The report is published as City Document No. 34, forming a very useful supplement to the report of the Department of Health.

Localization of Nuisances.

The presence of establishments more or less injurious to health, or which otherwise come within the category of local nuisances, may properly be indicated on a special map in much the same manner as this has been done in the biennial report of the Department of Health for the City of Chicago for the two years ending with 1905. This report contains a very instructive map showing the slaughtering and rendering plants, with the distinction of such as manufacture glue or fertilizers, also of tanneries and wool-pulling plants, which occupy considerable areas in the stock-yard district of the city. An amplification of this method will be found in the *Journal of American Sociology*, Volume VII, for 1901.

A similar method of emphasizing insanitary areas, or conditions giving rise to causes injurious to health, will be found in the first volume of the Report of the Department of Health of the City of New York

for the Year 1904, showing, among others, by means of a map, in part, the polluted watercourses of Staten Island, and places where oysters are freshened and unquestionably contaminated. A still more elaborate map, showing locations of stations in Boston harbor at which samples of water and shell-fish were collected for analysis, will be found in the Annual Report of the State Board of Health of Massachusetts for 1905.

Relation of Weather to Disease.

Epidemics of mortality from causes more or less connected with the weather, such as sunstroke and pneumonia, should be returned by single days for the period of exceptional frequency, supplemented by a daily record of the more important meteorological elements, in particular barometric pressure, minimum and maximum temperatures, rainfall, and humidity.

Mortality Rate from Infectious Diseases.

The mortality from contagious diseases should be supplemented by a table showing the number of reported cases, with distinction of age and sex. The fatality rate should not only be calculated in proportion to the total number of cases, but also separately, either by single ages or by periods of life. An illustration of this method will be found on page 45 of the Twenty-fourth Annual Report of the Superintendent of Health of the City of Providence, R.I., for the year 1906, showing the fatality rate from diphtheria for seven selected periods of life, first for the eighteen-year period, ending with 1905, and, second, for 1906 separately. The table, however, is for both sexes combined, which impairs its value, since it is desirable to have the information separately for the two sexes. It is also more advantageous to limit the comparative period to ten years instead of eighteen. An amplification of this method will be found on page 175 of the Annual Report of the London Metropolitan Asylums Board for 1906 and on page 39 of the Annual Report of the Medical Officer of Health of Manchester, England, for 1906.

Relative Value of Different Elements of Mortality.

The mortality returns by months should not be unduly elaborated, but limited to a few suggestive tables. Most of the board of health reports give an elaborate analysis of the mortality by months, which is of very limited value, instead of giving the necessary data by ages at death, which is absolutely indispensable. Of course, the mistake has its origin in the fact that the annual report, in most cases, constitutes a combination of the twelve monthly reports, but it would lead to a decided improvement if the analysis by months were eliminated in

many cases, and were replaced by tables showing the relation of age to cause of death. For many important purposes it is absolutely indispensable that the age and sex distribution of the mortality should be clearly stated, and every report should contain a complete statement of the mortality by important periods of life for each sex. This is the method which has been used practically from the beginning in the reports of the Registrar-General of England and Wales, and which also has been successfully carried through most of the tables of the United States census mortality reports. The vital statistics of the census, however, still continue to unduly elaborate the factor of season instead of giving due consideration to the far more important and fundamental elements of age, color, nativity, occupation, etc. As a matter of fact, the use of monthly death-rates has an extremely limited practical application, for, unless the mortality is given by days, it is next to impossible to trace the proper relation of diseases or mortality frequency to meteorological changes and departures from the normal. The annual mortality reports prepared under the direction of Mr. Wilbur are a decided improvement in this respect, but even these could be materially improved by a more complete separation of the mortality of the white and colored populations. I believe that it may be laid down as an axiom that, wherever the colored population exceeds 10 per cent. of the total, it should be considered the duty of the board of health to entirely separate the two mortalities and present the facts for each race by itself.

Mortality of Residents and Non-residents.

Every board of health report should clearly distinguish between the deaths of the resident and the non-resident populations, but only in the case of health resorts does it appear advisable to consider separately the mortality of non-residents in the calculation of the local death-rate. While the theoretical assumption probably does not hold entirely true, that the mortality of non-residents is balanced by the mortality of residents dying elsewhere, it will be found next to impossible to ascertain the facts with entire accuracy, except, possibly, in small communities. For illustration, the Board of Health of Brookline, in its report, makes a special tabulation of the deaths of Brookline residents who died in other places, and another of the deaths of residents of other places who died in Brookline. From various sources every health officer is likely to come into possession of information as to the deaths of residents in other places, and it perhaps would be advisable to make mention of such deaths in the report, without, however, incorporating the facts in the local mortality table. It would be a very important contribution to our knowledge of local mortality if mention were made of all

the important facts of this character, among others, for illustration, of deaths of residents occurring in tropical countries, such as Panama, the Philippines, etc., of deaths of residents occurring at sea, or deaths of residents committing suicide in other places, or who were murdered elsewhere, or whose lives were lost in railroad or other accidents. All such cases should be given, together with a statement of the age, sex, race, and nationality of the deceased, the place where the death occurred, and the cause in such detail as may be obtained. Where this method is adopted, the health officer will be, in fact, the public guardian of the life and health of *every* person properly considered a resident of the community, subject to the health department's jurisdiction, and a large amount of valuable information will be obtained regarding obscure deaths, which at the same time form an important element of vital statistics.

Suspicious Deaths and Coroners' Returns.

Coroners' returns should be given separately in addition to having been previously included in the general mortality tables. These returns are notoriously inadequate, and complaint as to their accuracy is universal, not only in this country, but abroad. As a Departmental Committee of the British Home Office observed in 1899, "We are so much impressed by the insufficiency and untrustworthiness of the statistics relating to particular causes of mortality which can be gathered from returns of coroners' verdicts that we venture, though the matter is outside the terms of reference to us, to recommend strongly that some steps should be taken to secure that these verdicts should lend themselves more readily to clear classification by the Registrar-General; and, in particular, we suggest that in every case where the coroner is in possession of a medical certificate of death, or where medical evidence has been taken at the inquest, a copy of that certificate, or an abstract of that evidence, should be appended to the coroner's certificate when sent to the Registrar-General." A separate return of inquests by coroners, or medical examiners, as they are known in certain New England States, forms a valuable appendix to the registration reports of Rhode Island and Massachusetts, but they are not in such detail as would be desirable. The Rhode Island returns omit the sex and age, but the individual observations are quite valuable. Considering, however, the great importance of complete knowledge regarding all sudden, suspicious, or violent causes of death, a statement in more detail would lead to a material improvement and increase the practical value of our vital statistics. It would not be going too far if the report were to give a complete individual account of every suspicious or violent death, not in the form of a tabulation, but in the form of a brief but continuous sum

mary, somewhat after the method used by coal mine inspectors in their reports upon fatal accidents and the method used in the annual reports of the Board of Gas and Electric Light Commissioners of Massachusetts. A valuable summary of gas accidents will be found on pages 100 *et seq.* of the report for 1906, and a valuable table of electric accidents on pages 109 *et seq.* of the same report.

Descriptive Record of Deaths of Exceptional Interest.

Deaths of exceptional interest should be individually made note of without necessarily any attempt at tabulation. Upon many important health problems our present information is very limited, due to the fact that cases of exceptional interest or rare occurrence are included in the statement of the general mortality. This, for illustration, is true of deaths among persons of races and nationalities as yet only represented in this country in very small numbers, as in the case of Chinese, Japanese, Filipinos, Hawaiians, Porto Ricans, Syrians, Turks, etc. All such deaths should be briefly reviewed, together with a statement of the age, sex, race, nativity, and cause of death. This is also true of deaths from exceptional diseases, such as leprosy, anthrax, etc. For illustration, the annual report of the State Board of Health of Massachusetts for the year 1905 contains the statement that a death from anthrax occurred in Lynn, and that one death from leprosy occurred in Boston, and another in Wareham. While this statement is of interest, and valuable as a matter of record, no intelligent meaning is conveyed by a reference limited to mere numbers. It is certainly of sufficient public interest to know the class of people among whom such rare diseases occur, and for any attempt to trace the possible course in the spread of such diseases more information is necessary, which cannot be had without access to the original death records, which also may fail to give a sufficient explanation. It would take very little time, and would add materially to the value of vital statistics, if all such cases were commented upon in some detail. This is also true of deaths among abnormal persons, such as giants, dwarfs, persons of great weight, and others which may be classed among the abnormalities or curiosities of medicine. The human life which is at stake in such cases has its own distinct value, and, while reports of such cases are made in medical journals or in the proceedings of medical societies, it is nevertheless important that they should also be mentioned and briefly reviewed in the reports of the local board of health. In all such cases, however, the sex, age at death, race, and nativity should be stated, together with the cause.

Race and Mortality.

Next to age there is probably no more important element in vital statistics than race. Every city which has more than 10 per cent. colored population should publish in its annual health report, in the form of a separate table, the mortality of the colored population, according to age, sex, and cause. Cities containing a fair proportion of Asiatics, such as the cities on the Pacific coast and some of the large cities in the East, should present the mortality of the Chinese, Japanese, etc., separately, with due regard to age, sex, and cause of death. While, for illustration, the Annual Report of the Health Department of San Francisco contains a table of the estimated Mongolian population and the deaths occurring among the same during a period of twenty-five years, the table does not show the causes of death among this class, by ages at death, without which it is impossible to arrive at any definite conclusions regarding the mortality and specific disease liability of this class of foreigners. Where the number of such deaths is small, it is fully sufficient to give the facts briefly, without any attempt at tabulation, sometimes in the form of a foot-note to the regular tables. For illustration, the Fifty-first Annual Report of the City of Providence for the Year 1905, on page 14, gives a total of the white and colored mortalities since 1855, but there is no specific information as to the causes of death among the colored, which would be of great value in connection with mortality investigations among the negro population in the North. The same volume contains a report of mortality by nativity and parentage, stating, among others, that there were deaths of Greeks, Turks, Syrians, Chinese, Armenians, etc., but with no information as to the age at death and the cause. The cumulative value of such information in detail would be very great.

Mortality from Industrial Diseases and Accidents.

Deaths among persons employed in dangerous or unhealthful trades should be commented upon in detail and at some length. The number of such trades is not very large, and is usually concentrated upon a few locally important industries. The method of presenting occupation mortality statistics is, as a rule, very crude, and the tables printed are of very limited practical value. The best work in this direction is to be found in the annual reports of the medical officers of health of Sheffield and Blackburn, England. In the former the cutlery trades are the most important, and in the latter the textile industries. The Blackburn reports are a model well deserving of adaptation by every board of health of cities in which cotton and woollen mills give employment to a large

proportion of the population. What is practicable for Blackburn, England, should not be more difficult for Fall River, Lawrence, Lowell, etc., and, if such tables were introduced, they would for the first time afford an accurate insight into the extent of industrial diseases in this country. The reports of the State Board of Health of Rhode Island contain much valuable information upon this subject, but they fall short of the required details in that only the average age at death is given among men dying in different employments instead of the age distribution by divisional periods of life and from the more important causes. There is no need for any very extended elaboration of the causes of death, most of which have no connection with the occupation followed. A selection could readily be made for different localities, but, on the whole, the method adopted in the decennial supplements to the reports of the Registrar-General of England and Wales will be found most useful. Where the reports are limited to particular trades, such as the textile industry, where, of course, the chief causative factor is dust in its relation to diseases of the lungs and air passages, the causes of death need not extend beyond tubercular and respiratory diseases and accidents. It would always be advisable, however, to give the facts separately for such diseases as asthma, bronchitis, pneumonia, etc. Dangerous trades, in which fatal accidents are likely to occur, such as iron and steel works, should be reported upon in detail for the different important branches of the industry, or, if this is not feasible, then a simple but continuous record of every fatal accident occurring should be given, stating the age, specific occupation, and cause of death of the deceased.

Modification of Occupation Clause in Death Certificates.

In this connection it may be well worth while to consider whether it would not be advisable to modify the death certificate now in use by the Census Office and local registrars of vital statistics, to the extent that two questions should be answered with respect to occupation: first, the certificate should state the industry in which the deceased was employed; and, second, the specific employment followed. Not only are there many occupations of the same name, but in entirely different industries, but the industry itself may be confused with another of a similar character. This, for instance, is true of the pottery industry, hat-making, iron and steel works, glass works, etc. If these suggestions were adopted, the certificate would state, for illustration, in the case of a glass worker, that he was employed in the glass industry, but that his specific employment was, say, that of a pot-maker. In the iron and steel industry it would be stated that, while deceased was employed in the iron and steel industry, his specific employment was that, say, of

a furnace keeper. Such a record would prove invaluable in connection with special mortality investigations, such as, for illustration, is at present being conducted in behalf of "*Charities and the Commons*" in the city of Pittsburg, as part of what is called the Pittsburg Survey of Social, Sanitary, and Industrial Conditions. There are few subjects of greater practical importance likely to receive extended consideration in the near future than industrial diseases and industrial accidents. The agitation for employers' liability laws, following the progress of such legislation in England under what is known as the "Workmen's Compensation Acts," must needs rest upon accurate data, which at present is next to impossible to secure for this country. For an illustration of the method which should be adopted, the second volume of the decennial supplement to the Fifty-fifth Annual Report of the Registrar-General of England and Wales should be consulted, also the supplement to the Forty-eighth Annual Report of the Registrar-General of Scotland. The last-named report is the most recent contribution to occupation mortality, which will soon be followed by the second volume of the supplement to the Sixty-fifth Annual Report of the Registrar-General of England and Wales, which is now in course of being printed.

Mortality from Accidents.

Accidents should be returned in some detail to show the causes, together with the ages at death, with distinction of sex. It does not serve a very practical purpose to merely state the number of accidental deaths from all causes, and not even the international classification is entirely sufficient. The causes of industrial accidents, as far as possible, should be separately stated, and it would be better to give more attention to details in the case of accidents than to details of the method employed in suicide. A tabular presentation of such facts will be found in the second volume of the Annual Report of the Department of Health of the City of New York for 1904, pages 760 *et seq.*, but, unfortunately, the table does not make the distinction of sex and age, which is decidedly important. A more satisfactory method of presenting the facts relating to deaths from accidents and negligence at different periods of life and in full detail for thirteen classes, subdivided into many minor groups, will be found in the Sixty-eighth Annual Report of the Registrar-General of England and Wales for 1905, pages 398 *et seq.* A somewhat similar table is contained in the sixty-third registration report for Massachusetts, for 1904, pages 120 *et seq.*, being the tabulation of the deaths investigated by medical examiners. Every such table, however, requires to be supplemented by intelligent observations or comments upon such accidents as are of public importance and which might suggest methods by which their occurrence could be prevented. It is probably

one of the most serious defects of all mere statistical representation of numerical aggregates that the value of the individual item is obscured. The law of large numbers applies only to vast aggregates, and not to such cases as represent decided variations from the normal. It serves only a very limited practical purpose to be told that there were four deaths from actinomycosis, two from glanders, and six from anthrax, or malignant pustules, in Massachusetts in 1904. To give such statement practical value, it is necessary to state the age, sex, and occupation of the person dying from such rare and infrequent causes in connection with collateral facts explaining their occurrence.

Mortality from Homicide.

Homicides should be reported in detail, with a statement of such facts as may have come to the notice of the health department. In all cases the age, sex, and race of the person dying a violent death should be stated and the method by which the life was terminated. Such cases, also, might be amplified by a brief explanation, to form a continuous public record of deaths from violence in the different communities. Here, again, our health reports are very defective, and the defect is so much more to be deplored in view of the extremely high rate of homicide frequency prevailing throughout the country. The English returns distinguish between murder and manslaughter, and the returns make the further distinction of sex and the method of murder employed. As far as practicable, the classification of method follows the method of suicide and the cause of accidents. While judicial statistics relate to the person committing the murder, such statistics do not throw sufficient light upon the fact as to the victim. Such returns, however, should not only be in the aggregate, but in addition state the age, sex, and method of death.

Mortality of Paupers.

Deaths of paupers should be stated separately, together with a statement of the mode of interment or disposition of the body. At present a serious defect exists in the vital statistics of some of our cities, in that they do not afford an accurate insight into the record of pauper burials, usually so referred to. Certain cities return a low pauper burial rate for no other reason than that the bodies of paupers are turned over to medical institutions. Of course, the deaths, as such, have been registered in the usual manner, but for certain purposes it is desirable to know the number of persons who come within the designation of the pauper class and whose bodies were not disposed of in the usual manner. Of course there is a further distinction to be made between pauper bur-

ials and pauper funerals, but it would seem advisable to give a table in the annual report, showing the disposition of bodies according to the different methods which may have been adopted; that is to say, whether the bodies were buried in public cemeteries or the potter's field at public expense, or whether the remains were turned over to medical institutions. I am not aware that any such record exists at the present time. A table stating pauper burials has a decided social and economic value, and it is a matter of regret that the returns should be so fragmentary and more or less inaccurate. All who are interested in this particular question should consult the Thirty-seventh Annual Report of the Sanitary Department of the City of Glasgow for the Year 1906, which contains an exceedingly interesting report upon the interment of unclaimed and other bodies, by Mr. P. B. Mackintosh, for thirty years one of the chief clerks of the department, performing the duty of seeing all those decently buried who, from one cause or another, died in poverty or were found dead in the city, leaving no one behind or sufficiently interested to afford the body interment. This very instructive report supplements the classical report by Edwin Chadwick on "The Practice of Interment in Towns," printed in 1843, and the more elaborate Report of the Select Committee of the House of Commons on Death Certification, published as a Parliamentary paper in 1893.

Necessity for a Complete Record of Deaths.

Every health officer should consider it his duty to obtain a complete account of the disposition of every body of a deceased person within the limits of his jurisdiction. Much valuable evidence upon this point will be found in the first and second reports of the Select Committee on Death Certification previously referred to. The disposition of bodies should be accounted for by cemeteries, crematories, or otherwise,—by otherwise, I mean the possible and entire destruction of a body in the event of explosion, by fire, drowning, etc. For illustration, deaths have occurred of miners whose bodies were never recovered, and workmen have been covered by molten metal in the explosion of furnaces, with the result that the bodies were entirely destroyed. It is manifest that such body destruction should be accounted for separately and distinct from the cemetery returns.

Description of Cemeteries and Method of Interment.

Every health report should also contain a brief account of the different cemeteries, their areas, and the probable number of interments in the same. Cities having crematories should return a separate record of the cremations in such establishments, and a valuable table will be found in the

Annual Report of the Board of Health of the City of Boston for 1906, which includes a review of cremations throughout the world from the inception of this practice. Such returns, however, should state the cause of death, as well as the ages of the persons cremated, to afford a more complete insight into this practice. For further information the report of a Departmental Committee of the British Home Department, appointed to draft regulations to be made under the Cremation Act of 1902, should be consulted. This report includes regulations for the maintenance and inspection of crematories, the conditions under which cremations may take place, disposal of ashes, and the registration of cremations.*

Descriptive Cases of Exceptional Longevity.

Exceptional cases of longevity (that is, persons dying at say age ninety or over) should, as far as possible, be verified by the health officer and explained in detail. The second volume of the Report of the Health Department of the City of New York for 1904 (page 768) contains a table of the deaths of persons one hundred years of age and over, giving the date of death, age, name, nativity, cause of death, and the borough in which the death occurred. There is, among others, the death of a Russian woman aged one hundred and six years and three months, but there is no evidence as to the facts in the case. As a check upon errors widely prevailing regarding old age, and the material improvement in longevity during recent years as the result of sanitary advances or more perfect medical practice, it would be advisable to amplify such records by the results of a special inquiry. It will be found, almost without exception, that such cases of very extreme old age are reported in the case of colored persons, or persons of Irish or Russian birth, or of certain other European nationalities, for which certificates of birth are practically unobtainable. An exaggeration of such cases is in part claimed to be the cause of an apparent increase in longevity according to recently constructed life tables, which are made to rest upon the recorded age at death, but not upon the deaths of persons actually living to the ages stated. The subject has been very carefully investigated by Mr. T. E. Young, formerly president of the Institute of Actuaries, in a remarkable essay on Centenarians, published in 1899. A very instructive address upon the subject of old age, by Metchnikoff, was printed in the Smithsonian Report for 1904. While it is possible, and perhaps probable, that old age is attained in larger proportions than formerly, it is of the greatest importance to have the facts properly authenticated and verified.

* The Annual Report of the Health Commissioner of Milwaukee for 1906, p. 102, contains an illustration of a method which might be followed. The table includes the statement that, out of 5,387 bodies, 16 were used for anatomical purposes.

Population Estimates.

Population estimates for intercensal years should be fully explained, and every safeguard should be employed against an overestimate of the population. An estimate, however, is in all cases preferable to a repetition of the census returns for a certain year, and death-rates should not be calculated upon such a basis of population, as is sometimes the case. A stationary population in an American city is an anomaly and is very rarely met with. Cities decrease or increase in population, and almost without exception the latter is the general rule. For cities normally increasing in population by an excess of births over deaths the geometrical rate of increase is probably the most satisfactory. Cities increasing in population by an excess of births over deaths and an excess of immigration over emigration will probably best employ the arithmetical method of estimating population. A full explanation of these different methods will be found in "The Elements of Vital Statistics," by Dr. Arthur Newsholme, medical officer of health of Brighton, England, while a brief statement of the principles will be found in Harrington's "Practical Hygiene." For more extended comment upon the estimating of population, the first volume of the supplement to the Sixty-fifth Annual Report of the Registrar-General of England and Wales should be consulted, which contains the "Observations on Population Estimates," by A. C. Waters, F.S.S., chief clerk of the General Registry Office. The subject is also discussed in the mortality statistics of the Division of Vital Statistics of the Census Office, and among others in the Sixth Annual Report for 1905 (page 4). The accuracy of population estimates becomes doubtful after the fifth year intervening between the taking of two decennial censuses, and, where there is no State census under proper management and supervision, recourse must be had to police enumerations, directory estimates, new buildings erected, etc., as a check upon possibly exaggerated estimates of population. It is much to be desired that the federal government should take a population census every five years, limited to the age, sex, race, and nativity constitution of the population.

Crude and Corrected Death-rates.

The crude death-rates as generally calculated, per one thousand of estimated population, cannot serve as an accurate method of comparison with other cities or towns even of equal population, unless the evidence is satisfactory that the sex, age, and race constitutions of the two populations were nearly the same. Even a comparison of the local death-rate with earlier years is likely to be misleading, if important changes in the elements of population have taken place during the in-

tervening period. All crude death-rates require to be corrected for such changes and differences in the elements of population, and the method of calculating corrected death-rates is also fully explained in "The Elements of Vital Statistics," by Dr. Newsholme. A brief explanation of the method of correcting the local death-rate is to be found on page 701 of Harrington's "Practical Hygiene."

Mortality Rates by Divisional Periods of Life.

Every health report should, if possible, contain a table showing the mortality rates for all causes, and specified causes, by divisional periods of life, calculated upon the basis of the number of living population at corresponding ages. Such tables may be calculated with approximate accuracy upon the basis of the age distribution as ascertained by the last census and applied in the form of a percentage to the population estimated for intercensal years. The method is admirably illustrated in the tables which have been published for many years in the annual reports of the Registrar-General of England and Wales, among others on pages 13 *et seq.* of the report of this official for the year 1905. In these tables the general death-rate for all ages has been corrected for changes in the age and sex constitution of the population since 1856, but specific death-rates are calculated for twelve divisional periods of life, with distinction of sex. (See also the Annual Report of the Medical Officer of Health for Manchester, England, for 1906, pages 14-15.)

Approximate Life Tables.

For localities with a reasonably stable population, not subject to an undue influx of foreigners or non-residents, approximate life tables may be calculated upon the basis of a ten-year average mortality, either by the approximate method adopted by Dr. Billings for certain American cities in connection with the censuses of 1890 and 1900 or the more refined methods adopted for certain English cities, such as Brighton, Oldham, Manchester, etc. Extreme care in the calculation of life tables, however, is necessary, and it is imperative that they should represent the true facts rather than a mathematical fiction. If the errors in age enumerations of the population are too apparent and too wide apart from the probably true condition, no method has yet been devised, nor is there any law of error, by which such disharmonies can be reduced to a normal basis, whether it be the graphic or any other method known to actuarial science. The errors and fallacies in life tables are, unfortunately, very far from being generally recognized, but they were never more clearly set forth than by Dr. Rumsey in his address before the

Manchester Statistical Society, where he discussed the question, "Are Life Tables, National or Local, Evidence of Sanitary Condition?" The essays were republished in 1875 under the title "Essays and Papers on Some Fallacies of Statistics concerning Life and Death, Health and Diseases, with Suggestions towards an Improved System of Registration."

These are only a few illustrations of the direction in which the practical value of vital statistics can be very materially increased. Many matters have been necessarily left out on account of the limitation of space. Among those which perhaps should have been included are graphic representations of statistical results in the most readily comprehended form; the statistics of childbirth, by ages of mothers and previous issue, as admirably illustrated in the reports on the vital statistics of New South Wales; the mortality of the married and single, by ages at death and causes in a somewhat more extended form than was used in the Census of 1900. To some of these I have had occasion to call attention in my review of "The Vital Statistics of the Census of 1900," published in the *Quarterly Publications* for December, 1902, and "The General Death-rate of Large American Cities, 1871-1904," published in the *Quarterly Publications* for March, 1906.